

ON THE GENERIC RELATIONS OF *BELONE EXILIS* GIRARD.

By DAVID S. JORDAN and CHARLES H. GILBERT.

The "needle-fish" (*Belone exilis* Girard), of the California coast, differs from the type of the genus *Belone* in the development of the gill-rakers. In *Belone vulgaris* the gill-rakers are well developed, long, and slender, and a patch of teeth is present on the vomer. In *Belone exilis* the gill-rakers are entirely wanting, and there are no vomerine teeth. The gill-rakers are also wanting in the Atlantic species, *Belone longirostris* (Mitch.), *Belone latimana* Poey, *Belone melanochira* Poey, *Belone notata* Poey, and *Belone hians* (Cuv. & Val.), and probably also in *Belone cantraini*, which is the type of the genus *Tylosurus* Cocco. The generic name *Tylosurus* may therefore be provisionally adopted for the species of *Belone* without gill-rakers. The caudal keel on which the genus *Tylosurus* was based, and which is developed in *T. exilis* as in *T. cantraini*, has apparently no systematic importance.

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NOTES ON A COLLECTION OF FISHES FROM UTAH LAKE.

By DAVID S. JORDAN and CHARLES H. GILBERT.

A short visit to Provo, Utah, on Utah Lake, enabled one of the writers to make a small collection of the fishes of that locality. This collection has been since supplemented by an excellent series of the different species, presented to the United States National Museum by Peter Madsen and sons, fishermen at Provo. Four of the thirteen species obtained seem to be new to science.

1. *Cottopsis semiscaber* Cope.—Bull-head.

Two specimens. Professor Cope says of his types: "Skin prickly above the lateral line, smooth below it posteriorly." Our specimens are villous above and below, as in *Cottopsis asper*, from which *C. semiscaber* differs chiefly in the less number of rays in the vertical fins.

The genus *Cottopsis* is distinguished from *Centridermichthys* mainly by the absence of a slit behind the fourth gill, which, as I am informed by Dr. Günther, is present in *Centridermichthys fasciatus*. *Centridermichthys uncinatus*, of the North Atlantic, agrees with *Cottopsis* in this respect, and should probably be referred to it. The American genera of Cot-

toids may be divided into two series, on the presence or absence of this slit, as follows:

Without slit.	With slit.
Ascelichthys.	Blepsias.
Psychrolutes.*	Nantichthys.
Cottunculus.	Blennicottus.
Uranidea.	Oligocottus.
Cottopsis (including Tauridea and Potamocottus).	Leptocottus.
Cottus.†	Scorpænichthys.
Artedius.	Liocottus.
Hemitripterus.	Triglopsis (including Oncocottus).
	Gymnacanthus.
	Aspicottus.
	Icelus.
	Triglops.
	Hemilepidotus.
	Melletes.

2. *Coregonus williamsoni* Grd.—*Mountain Herring*.

Very abundant.

3. *Salmo purpuratus* Pallas.—*Lake Trout*; *Brook Trout*.

(*Salmo clarki* Rich.)

Very abundant in Utah Lake; a food-fish of much value.

Specimens obtained do not differ in any visible respect from others taken in salt water in Puget Sound. This is apparently the parent stock from which *S. spilurus*, *S. irideus*, and *S. gairdneri* Rich., (*S. truncatus* Suckley) have scarcely yet become completely differentiated. *S. henshawi* Gill & Jor. is a marked local variety of *S. purpuratus*.

4. *Squalius tænia* (Cope) J. & G.—*Leather-side Minnow*.

Very abundant. We find it impossible to separate the genera *Squalius*, *Telestes*, *Tigoma*, *Siboma*, *Cheonda*, and *Clinostomus*, and we adopt for the whole group the name of *Squalius*. The genus *Dobula* was established by Rafinesque in the Ichthyologia Ohiensis (1820, p. 45). Although no type is stated, it was probably based on the *Cyprinus dobula* L., afterwards the type of *Squalius* Bonaparte.

5. *Squalius montanus* (Cope) J. & G.

Also abundant.

6. *Squalius cruoreus*, sp. nov.

Allied to *Squalius ardesiacus* Cope, but with larger scales and shorter head.

\* We are unable to perceive any distinction between the *Psychrolutidæ* and the *Cottidæ*. *Psychrolutes* has a rudimentary spinous dorsal, hidden in the loose skin.

† In *Cottus granlandicus*, *polyacanthocephalus*, and *scorpius* a small pore is present behind the last gill. In other species (*octodecimspinosus aeneus*, *scorpioides*), the slit appears to be wholly obliterated. In a specimen of *C. polyacanthocephalus* of about two feet in length there is visible a minute pore representing the usual last slit.

Form of the species termed "*Clinostomus*", but less compressed. Body moderately elongate, somewhat compressed, symmetrical, the back considerably arched; caudal peduncle rather stout. Head subconical, laterally compressed, broad and rounded above; mouth short, oblique, jaws about equal. Premaxillary in front on the level of the lower edge of the pupil; maxillary reaching to opposite the front of the eye. Eye large, about as long as snout,  $4\frac{1}{2}$  in head. Isthmus narrow; scales firm, not closely imbricated; the belly with imbedded scales. Lateral line complete, running low, but not greatly decurved. Dorsal fin inserted a little behind the ventrals, scarcely nearer base of caudal than snout. Caudal fin evenly forked. Pectorals shortish, not reaching nearly to the ventrals; the ventrals reaching to the vent. Head contained 4 times in length to base of caudal; greatest depth equal to length of head. Fin-rays: Dorsal 9; anal 8. Scales 11-56-6. Teeth 2, 5-4, 2, without evident masticatory surface. This latter character is, however, so variable in the Cyprinoids of this type as to be scarcely even of specific value. Back and fins dusky bluish; sides of body and head dark, with fine punctulations; a red spot at base of each ventral and of anal.

Numerous specimens, the longest 6 inches in length. This species is related to *S. ardesiacus* (Cope), but it has a deeper body and larger scales, the pectorals are shorter and length of the head proportionately less.

**7. *Squalius copei*, sp. nov.**

(*Hybopsis egregius* Cope, Ann. Rept. U. S. Geol. Surv. Terr. 1870, 438; Cope & Yarrow, Wheeler's Expl. W. 100th Mer. v, 662, 1877; not *Tigoma egregia* Girard.)

Numerous specimens of this species were obtained at Evanston, Wyo., of boys fishing with hook and line in tributaries of Bear River. It has not been observed in Utah Lake. As the original types of *Tigoma egregia*, examined by us, have 66 scales only in the lateral line, the species called *Tigoma egregia* by Professor Cope is distinct from it, and may receive the above specific name.

**8. *Squalius atrarius* (Girard) J. & G.**

This "chub" is very abundant in Utah Lake. It is exceedingly destructive to the young trout, well meriting the epithet of "devilish chub" applied to it by Mr. Madsen.

**9. *Squalius rhomaleus*, sp. nov.**

Allied to *Squalius niger* (Cope), but with the large scales of *Squalius squamatus* (Gill).

Body robust, elevated anteriorly, somewhat compressed or flat-sided, although the back is very broad. Head broad, considerably concave in profile as seen from the side, as in the groups called *Platygobio* and *Gila*; the interocular space flattish, scarcely raised above the level of the upper edge of the eye. Snout rather broad, somewhat elevated at tip; the premaxillary on the level of the pupil; the form of the head resembling that of *Chasmistes*. Mouth very oblique, its cleft at an angle of about  $45^{\circ}$ ; the mandible much projecting. Maxillary extending to the

front of the eye. Eye small, anteriorly placed, its diameter  $1\frac{3}{4}$  in snout, 7 times in the length of the head. Isthmus very narrow, the gill-openings extending forward below. Teeth 2, 5-4, 2; one of the teeth in the larger series with a broad, flattish, grinding surface, the others convex; the teeth comparatively short and stout. Scales large for the genus, subequal over the body, rather smaller on the belly, their texture firm, their exposed surfaces very broad and hexagonal. Dorsal fin inserted directly over the ventrals, behind the middle of the body. Caudal fin evenly forked, on a stout, rather long caudal peduncle, the rudimentary rays at its base not more than usually developed. Pectorals not long, extending three-fifths the distance to the ventrals; the ventrals about to the vent; the lower fins all short. Fin-rays: Dorsal 9; anal 8. Scales 10-55-5. Length of head contained  $3\frac{1}{2}$  times in the total length to the base of caudal; the greatest depth of the body about the same.

Color blackish, fins all dusky. The ground shade is somewhat silvery, but the color is rendered very dark by the large number of small black specks.

The typical specimens, two in number, are about a foot in length. This is therefore one of the largest members of the genus.

#### 10. *Apocope vulnerata* Cope.

Numerous specimens, some of them 5 inches in length. The large specimens have the lateral line developed anteriorly only. Pectoral fins short, not reaching nearly to ventrals. Lat. l. about 70.

#### 11. *Chasmistes liorus* Jordan.—*June Sucker*.

A considerable number of fine specimens of this interesting species are in the collection, all of them about 18 inches in length. Color olivaceous above, with dusky mottlings formed of dark points; belly white; fins chiefly pale, shaded at the tips with dusky. Anal and lower lobe of caudal tuberculate in the males. Body slender, heavy at the shoulders, somewhat compressed, the caudal peduncle stoutish; depth of body at the shoulders half more than its thickness. Head not conic, low at the nape, and strongly concave in profile above, from the great prominence of the premaxillary spines, which form a conspicuous nose, elevated above the eye, and with its top even with the interorbital space, which is very broad and nearly flat. Preorbital large; suborbital moderate. Mouth large and very oblique, anteriorly on the level of the suborbital bones; the mandible strong, placed at an angle of  $45^{\circ}$ , its base below the nostrils, its length equal to that of the snout, which is about three-sevenths that of the head. Upper lip somewhat protractile, narrow, vertical, its edge smooth; lower lip narrow, the two lobes well separated, very faintly plicate, the plicæ slightly uneven. No cartilaginous sheath to the jaws. Interorbital space nearly equal to length of snout. Eye small, exactly median, 7 in head. Isthmus as broad as eye. Pharyngeal teeth essentially as in *Catostomus*. Scales much reduced in size and crowded anteriorly, those on the breast imbedded in the skin. Scales



7-61-9; 28 series in front of the dorsal. Insertion of dorsal nearly midway between snout and base of caudal, the fin elevated in front, the anterior ray twice the height of the posterior, and about equal to the base of the fin; the free margin of the fin nearly straight. Caudal fin deeply forked, the lower lobe the longer. Lower fins all small. Dorsal rays 11; anal 7.

**12. *Catostomus fecundus* Cope & Yarrow.**—*Utah Sucker.*

This species occurs in Utah Lake in numbers which are simply enormous, justifying Mr. Madsen's assertion that the lake is the "greatest sucker pond in the universe". It is very destructive to the trout. It ascends the rivers in the spring to spawn at the same time as the latter species, on the eggs of which it feeds. In the interest of the food supply of Salt Lake City an organized attempt at the reduction or extirpation of this species may become necessary. The old trout feed largely on the young of this species, but the "suckers eat the trout first". No full description of *Catostomus fecundus* has been yet published. It will be seen from the following account that it is well separated from all its congeners, and that in many respects it approaches *Chasmistes liorus*. It is, in fact, probably the parent stock of the genus *Chasmistes*.

Body moderately stout, a little elevated, not much compressed, tapering into a long and slender caudal peduncle. Head subconic, the profile regularly decurved from the nape to the base of the premaxillary spines, which abruptly protrude, forming a distinct "nose", as in *Chasmistes liorus*. Preorbital long. Premaxillary a little below the level of the preorbital. Mandible large, oblique, placed at an angle of 30° when the mouth is closed; its length about one-third that of the head. Upper lip protractile, full, pendant, with about four rows of coarse papillæ. Lower lip moderately developed, divided nearly into two parts by a broad emargination, each lobe with about six rows of coarse papillæ. Mouth not large. Interorbital space strongly convex, its width nearly equal to length of snout. Eye a little behind the middle of the head, its diameter contained 7 times in the length of the head. Isthmus broader than eye. Scales 8-60-8, reduced in size forward; breast scaly.

Insertion of dorsal about midway between snout and base of caudal; the first ray nearly twice the height of the last, its length greater than that of the base of the fin. Caudal fin moderately forked, the lower lobe longest and widest. Pectorals long, reaching more than half way to ventrals, the latter not to vent. Anal high. Fin-rays: Dorsal 11; anal 7; ventrals 9. Length of head contained 4 times in total length to base of caudal; greatest depth  $4\frac{1}{2}$  times. Color blackish above, silvery below, the fins slightly dusky tinged, the dark colors formed of black points.

This species seems to reach a smaller size than the other lake suckers.

13. *Catostomus ardens*, sp. nov.(? *Catostomus guzmaniensis* Cope & Yarrow; not of Girard.)A large, thick-lipped species, allied to *C. macrochilus*, &c.

Body rather elongate, subfusiform, little compressed, the back broad and somewhat elevated. Head conical, broad and convex above, the front regularly sloping from the nape to the snout. Mouth entirely inferior, the mandible quite horizontal, the premaxillaries scarcely raised above the level of the base of the mandible. Upper lip very wide, full, pendant, with about eight rows of coarse, irregular papillæ, of which the second and third rows from the inside are much larger than the others; upper lip continuous with the lower at the angle of the mouth. the lower lip cut to the base in the middle by a deep, abrupt incision. Front of eye midway in head. Eye very small, 7 in head,  $3\frac{1}{2}$  in the convex interorbital space. Isthmus broad, half broader than the eye. Fontanelle large, as in the other species noticed in this paper. Scales crowded anteriorly, 9-65-9. Breast with evident imbedded scales. Dorsal fin inserted a little behind the middle of the body, long and low, its anterior rays but three-fourths the length of the base of the fin,  $1\frac{1}{2}$  the length of the last rays; the free edge of the fin straight. Caudal fin short and broad, about equally forked, its upper lobe two-thirds the length of the head. Pectorals short and broad, their length three-fourths that of the head. Ventrals short, not quite reaching vent. Anal very high, reaching caudal. Dorsal rays 13; anal 7. Length of head  $3\frac{2}{3}$  in body to base of caudal; greatest depth  $4\frac{1}{2}$ . Teeth essentially as in the others.

Color blackish above, blotched with darker, the whole back and sides obscurely spotted; belly white; a narrow, bright, rosy, lateral band on the anterior part of the body, overlying the blackish; fins mostly dusky mottled; top and sides of head rendered dusky by the presence of many dark specks.

This species is described from a large adult male nearly 18 inches in length, besides which we have a single young specimen.

There is another specimen in the collection, a large male fish 18 inches long, which agrees entirely with the type of *C. ardens*, with the following exceptions: The lower lip is wider, with less conspicuous, coarse, irregular papillæ, in 8 to 10 rows; the upper lip with two rows of large papillæ and several series of small ones. The caudal fin is much larger, the upper lobe three-fourths the length of the head, the lower broader than the upper; the pectoral fin is very long, but little shorter than head; and the ventrals reach the vent. The dorsal has 12 rays, and is long and low, as in *C. ardens*. The scales on the breast are almost obsolete. The isthmus shows a structure very different from that of any other Catostomoid fish known. The gill membranes are partly free posteriorly, their free margins forming a broad fold across the narrow isthmus, as in the genus *Cottus*. This structure appears normal, and is not the result of injury. If it be permanent, this form should probably constitute a distinct genus; if not, it may not be sepa-

rable as a species from *Catostomus ardens*. Meanwhile we abstain from giving a new name until more specimens can be obtained to settle the question.

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**DESCRIPTION OF A NEW SPECIES OF "ROCK-FISH" (*SEBASTICHTHYS CHRYSOMELAS*), FROM THE COAST OF CALIFORNIA.**

**By DAVID S. JORDAN and CHARLES H. GILBERT.**

*Sebastichthys chrysomelas*, sp. nov.

(*Sebastichthys nebulosus* Jordan & Gilbert, Proc. U. S. Nat. Mus. iii, 1880, 73, and elsewhere; not *Sebastes nebulosus* Ayres.)

In previous papers on the California rock-fish we have provisionally identified one of the common species as the *Sebastes nebulosus* of Ayres. Ayres himself, however, considered his own *nebulosus* as without question the *Sebastes fasciatus* of Girard, which is the *Sebastichthys fasciolaris* of Lockington. The two species agree closely in general characters, but differ in the development of the spines on the head, and especially in color, the "*fasciolaris*" having the yellow markings in the form of small spots or specklings, which are confluent along the sides, forming a sort of band, the other species having the yellow areas all large. The original description of *Sebastes nebulosus* Ayres (Proc. Cal. Acad. Nat. Sci. i, 5, 1854) applies in the main to both species; but the account of the coloration applies to *S. fasciolaris* Lockington, and not to our "*S. nebulosus*".

Ayres says:

"In color this fish is finely mottled with dusky yellow and dark brown; on the fins the latter hue predominates, and the lighter mottlings have rather a bluish aspect."

We propose, therefore, to consider *fasciolaris* a synonym of *nebulosus*, and to give to the species previously called *nebulosus* by us the new name *chrysomelas*, in allusion to its yellow and black coloration.

**DESCRIPTION.**—Body short and stout, not much compressed; highest at the origin of the first dorsal, thence tapering rapidly to the tail. Head short, bluntish, the profile very steep. Mouth rather small, nearly horizontal, entirely below the axis of the body. Lower jaw rather shorter than the upper in the closed mouth; no prominent symphyseal knob. Premaxillaries anteriorly on the level of the lower edge of the orbit; maxillary reaching the vertical from the posterior margin of the pupil.

Preorbital wide, its neck about half the diameter of the eye, its margin sinuate, usually with a spine.

Ridges on top of head very prominent, high and strong, ending in strong spines, which diverge backward. They are a little stronger than in *S. carnatus*, but lower than in *S. nebulosus*. The following pairs are present: Nasal, preocular, supraocular, tympanic, and occipital, five in all. Preopercular spines short and thick, the uppermost usually the